coatings, and treatments, it nevertheless deteriorates with time."

Ceramic is only suggested as an "alternative" to graphite.

Weber does not teach of using ceramic for providing a barrier for protecting a carbon leg. His carbon based nozzles are in direct contact with the molten metal. Member 5 is used as a reinforcement element, not as a protective ceramic sleeve.

In another embodiment of the invention, the support is defined in claims 15-18 as a graphite leg having a clearance between the leg and a ceramic sleeve, and an inert non-gaseous material disposed in the clearance to form a non-combustible barrier between the graphite leg and the molten metal. This clearly avoids the teachings of the cited art.

Thut (Col. 6, lines 32-37) discloses a refractory sleeve 122. However, leg 128 is exposed to molten metal entering sleeve 122 through openings 132. He does not suggest either a ceramic sleeve, or means enclosing the leg, including the sleeve. Applicant on the other hand specifically defines that part of a graphite leg is disposed in the metal and totally enclosed with a barrier between the leg and the metal, including a ceramic sleeve.

Ceramic and refractory cement are different materials made in different ways with different properties. Refractory is typically cast at room temperature by a reaction of materials, much like concrete is formed. A refractory material typically has a high porosity.

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Although molten metal cannot penetrate a refractory sleeve, a gas, such as oxygen, can penetrate it.

Ceramics are made by a chemical reaction in a firing process. The firing process reduces or eliminates the porosity. The porosity level can be controlled in accordance with the user's specifications. A ceramic having zero porosity to a gas is desirable because it will prevent any gas, such as oxygen, from passing through the ceramic sleeve so as to cause the graphite to burn.

Typically, the porosity of refractory is in the neighborhood of 20%. Ceramic has a porosity of about 4%, and if using a boron nitride, the porosity can be reduced from zero to 2%.

However, a totally non-porous ceramic material is very expensive. A compromise is to use a low porosity material for the ceramic sleeve and then to fill the cavity containing the graphite leg with nitrogen gas. This prevents the entry of oxygen into the sleeve to contact the carbon leg.

A ceramic with a low or zero porosity is very effective in preventing the penetration of oxygen but it has a different coefficient of expansion with respect to the graphite, thereby creating a chimney effect. Consequently, it is desirable to provide a gap or a clearance between the carbon and the ceramic to accommodate the different coefficients of expansion. A refractory cement with boron nitride can be employed, between the leg and the sleeve, cement being somewhat flexible but inert.

Claims 16 and 17, which claim such a cement, define a leg that does not require an inert gas since the boron nitride cement creates a barrier to oxygen.

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The nylon tape prevents the refractory and the graphite from being attacked by oxygen. The ceramic sleeve protects the graphite from being attacked by molten aluminum.

Claims 25-28 define a graphite leg and a ceramic sleeve together with specific means for connecting the leg to a pump housing.

The claims are therefore now believed to be in condition for allowance. Such action is requested.

Respectfully submitted,

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